

Biology, Semester B

Course Overview

Biology, Semester B, is a single-semester course designed to strengthen your knowledge of biology concepts. The first unit focuses on the classification, characteristics and biological processes of living organisms. In the second unit, you'll study evolutionary mechanisms and the impact of environmental factors on species over time. The third unit focuses on the conservation of energy as it relates to living things and different ecosystems. In the last unit, you'll explore how different ecosystems are interdependent.

Course Goals

By the end of this course, you will be able to do the following:

- Classify insects based on their physical and developmental characteristics.
- Explain the major characteristics of archeobacteria, bacteria, and protists.
- Compare the characteristics and biological processes of plants and fungi and of invertebrates and vertebrates.
- Evaluate the effects of evolutionary mechanisms on the characteristics of current and extinct species.
- Explain the effect of environmental changes on the selection of desired traits in a population.
- Explain how genetic variation, natural selection, and environment lead to adaptations in organisms.
- Explain conservation of energy as it relates to living things and different ecosystems.
- Develop a model to show how photosynthesis and cellular respiration transform and use energy.
- Explain the need for macronutrients and micronutrients in the human body to support homeostasis and the use of energy.
- Explain how the cycling of matter and energy interacts with biological processes.
- Analyze the effects of environmental changes on relationships in an ecosystem.
- Use mathematics to explain the factors that affect carrying capacity of ecosystems at different scales.
- Explain how a change affects biodiversity of an ecosystem.
- Use evidence and scientific reasoning to choose the best solution to a biodiversity problem.

General Skills

To participate in this course, you should be able to do the following:

- Complete basic operations with word processing software, such as Microsoft Word or Google Docs.
- Understand the basics of spreadsheet software, such as Microsoft Excel or Google spreadsheets, but prior computing experience is not necessary.
- Perform online research using various search engines and library databases.
- Communicate through email and participate in discussion boards.

For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Student Orientation document, found at the beginning of this course.

Credit Value

Biology B is a 0.5-credit course.

Course Materials

- notebook
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft Excel or equivalent
- Microsoft PowerPoint or equivalent
- materials listed in Appendix B (Appendix C provides a detailed breakdown of these materials per activity.)

Course Pacing Guide

This course description and pacing guide is intended to help you stay on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class.

Unit 1: Organization of Organisms

Summary

This unit begins with an activity that involves classifying insects based on their characteristics. Next, you'll study the major characteristics of archeobacteria, bacteria, and protists. Finally, you'll compare the characteristics and biological processes of plants and fungi and then compare the characteristics and biological processes of invertebrates and vertebrates.

Day	Activity/Objective	Type
1 day: 1	Syllabus and Student Orientation <i>Review the Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
3 days: 2–4	Classifying Organisms <i>Classify insects based on their physical and developmental characteristics.</i>	Course Activity
3 days: 5–7	Bacteria and Protists <i>Explain the major characteristics of archeabacteria, bacteria, and protists.</i>	Lesson
3 days: 8–10	Plants and Fungi <i>Compare and contrast the characteristics and biological processes of plants and fungi.</i>	Lesson
3 days: 11–13	Animals <i>Compare and contrast the characteristics and biological processes of invertebrates and vertebrates.</i>	Lesson
5 days: 14–18	Unit Activity and Discussion—Unit 1	Unit Activity/ Discussion
1 day: 19	Posttest—Unit 1	Assessment

Unit 2: Evolution

Summary

In this unit, you'll examine evolutionary mechanisms and design a simulation that shows the effects of change in the environment on the selection of desired traits in a population. You'll then explain how genetic variation, natural selection, and environment lead to adaptations in organisms. You'll use the genetic data of a particular animal species to construct a written argument for the long-term viability of a specific breed. Finally, you'll explain how environmental changes can lead to the development of new species or an increase or decrease in the population of a species.

Day	Activity/Objective	Type
3 days: 20–22	The Process of Evolution <i>Evaluate the effects of evolutionary mechanisms on the characteristics of current and extinct species.</i>	Lesson
3 days: 23–25	Adaptations in a Changing Environment <i>Design a simulation that shows how a change in the environment influences the selection of desired traits in a population.</i>	Course Activity
3 days: 26–28	Natural Selection <i>Explain how genetic variation, natural selection, and environment lead to adaptations in organisms.</i>	Lesson
4 days: 29–32	Artificial Selection and the English Bulldog <i>Use the genetic data of the English bulldog to construct a written argument for the long-term viability of the breed.</i>	Course Activity
3 days: 33–35	Environmental Impacts on Evolution <i>Use evidence to show that changes in the environment may result in changes in a species over time.</i>	Lesson
5 days: 36–40	Unit Activity and Discussion—Unit 2	Unit Activity/ Discussion
1 day: 41	Posttest—Unit 2	Assessment

Unit 3: Energy Use and Organisms

Summary

You'll begin this unit by learning about the conservation of energy as it relates to living things and ecosystems. You'll then develop a model to show how photosynthesis and cellular respiration transform and use energy. You'll explain the relationship between aerobic and anaerobic respiration through experimentation. Finally, you'll explain the importance of macronutrients and micronutrients to the human body.

Day	Activity/Objective	Type
3 days: 42–44	Introduction to Energy <i>Explain conservation of energy as it relates to living things and different ecosystems.</i>	Lesson
3 days: 45–47	Photosynthesis and Cellular Respiration <i>Develop a model to show how photosynthesis and cellular respiration transform and use energy.</i>	Lesson
4 days: 48–51	Aerobic and Anaerobic Respiration <i>Use the results of an experiment to explain the relationship between aerobic and anaerobic respiration.</i>	Course Activity
3 days: 52–54	Macronutrients and Micronutrients <i>Explain why the human body needs macronutrients and micronutrients to support homeostasis and the use of energy.</i>	Lesson
5 days: 55–59	Unit Activity and Discussion—Unit 3	Unit Activity/ Discussion
1 day: 60	Posttest—Unit 3	Assessment

Unit 4: The Interdependence of Ecosystems

Summary

In the last unit, you'll learn about biological cycles and investigate the effects of environmental changes on an ecosystem's major relationships, such as predator–prey, symbiosis, and mating. You'll also study the effects of environmental changes on competition of resources. Next, you'll explain the factors that affect carrying capacity of ecosystems and analyze the effects of change on the biodiversity of an ecosystem. Finally, you'll create a simulation to solve a biodiversity problem and use models and predictions to determine the best solution to the problem.

Day	Activity/Objective	Type
3 days: 61–63	Cycles in Ecosystems <i>Explain how the cycling of matter and energy interacts with biological processes.</i>	Lesson
3 days: 64–66	Relationships in Ecosystems <i>Analyze evidence of the effects of environmental changes on relationships in an ecosystem.</i>	Lesson
4 days: 67–70	Competition in Aquatic Ecosystems <i>Develop a model of the flow of energy in an aquatic ecosystem and show how an environmental change affects competition of resources.</i>	Course Activity
3 days: 71–73	The Carrying Capacity of Ecosystems <i>Use mathematics to explain the factors that affect carrying capacity of ecosystems at different scales.</i>	Lesson
3 days: 74–76	Factors that Affect Biodiversity <i>Use evidence to explain how a change affects biodiversity of an ecosystem.</i>	Lesson
3 days: 77–79	Solving a Biodiversity Problem <i>Create a simulation to test a solution that could relieve harmful impacts of human activity on biodiversity.</i>	Lesson
3 days: 80–82	Conserving Biodiversity <i>Use evidence and scientific reasoning to choose the best solution to a biodiversity problem.</i>	Lesson
5 days: 83–87	Unit Activity and Discussion—Unit 4	Unit Activity/ Discussion
1 day: 88	Posttest—Unit 4	Assessment
1 day: 89	Semester Review	

Day	Activity/Objective	Type
1 day: 90	End-of-Semester Exam	Assessment

Appendix A: Safety Notes and Disclaimer

Each Course Activity and Unit Activity that includes a lab or experiment component will highlight key safety guidelines using the safety icon (⚠), which appears directly in the activity. In addition to adhering to those guidelines, you must ensure that you follow these general safety practices:

- Work slowly and safely at all times, and abide by the safety notes and icons.
- Pay attention and be alert at all times. Limit any distractions.
- Keep your hands away from your nose, eyes, mouth, and other skin. Wash your hands before and after experiments.
- If you don't understand something, ask a teacher or an adult before proceeding.
- Wear the required protective gear.
- Adult supervision is required for all activities involving an experiment/lab component.
- Do not perform experiments that have not been approved. Follow the procedures.
- Follow good housekeeping practices. Keep your work area clean.
- Abide by all disposal instructions and icons to protect yourself and our planet.
- Report any problems or complications to an adult.

NOTE: *Edmentum assumes no liability for personal injury, death, property damage, equipment damage, or financial loss resulting from the instruction included in this course.*

Appendix B: Course Lab Materials (Semesters A and B)

Household Materials

- pen or pencil
- colored pencils or markers
- white paper
- plastic wrap
- construction paper (4 different colors—about 2 sheets of each color)
- scissors
- masking tape
- ruler with a metric scale
- measuring cup (1 cup, graduated)
- tablespoon
- stopwatch (could be a mobile app or on a computer)
- lunch-sized microwaveable container (about 5 inches wide x 4.25 inches high x 3 inches long)
- oven mitts
- tap water
- granulated sugar
- milk (any variety)
- word-processing or graphic-design software
- presentation software

Household Materials – Less Common

The italicized materials below are available as a convenience in the *Edmentum Biology Kit*.

- poster board
- corkboard
- modeling clay
- firm stress ball or tennis ball
- 5 (0.25-ounce) packets dry yeast
- 5 24-ounce clear drinking glasses (either glass or plastic, as long as they can safely hold hot water)
- food thermometer (must go up to 100° Fahrenheit)
- kitchen scale (with 0.1 gram accuracy)
- photo-editing software

- *safety goggles*
- *disposable safety gloves*

Science Laboratory Materials

All materials listed in italics below are available in the *Edmentum Biology Kit with Microscope*.

- *compound microscope*
- *allium root tip specimen* (or 1 slide of a plant tissue specimen)
- *cork section specimen* (or 1 slide of a plant tissue specimen)
- *Zea mays leaf specimen* (or 1 slide of a plant tissue specimen)
- *human blood smear specimen* (or 1 animal tissue specimen)
- *cardiac muscle specimen* (or 1 animal tissue specimen)
- *frog skin specimen* (or 1 animal tissue specimen)
- *paramecium specimen* (or 1 slide of a single-celled organism specimen)
- *3 400-milliliter beakers* (or 3 plastic pint glasses)
- *3 test tubes* (or seven 3-ounce disposable paper cups)
- *100-milliliter graduated cylinder* (or a 1-cup measuring cup)
- *10-milliliter graduated cylinder*
- *1 stirrer* (or spoon)
- *glucose test strips* (may be purchased at any drugstore)
- *2 lactase pills* (can be found in the dietary section of any drugstore)
- *insect specimens in solution (15 diverse insects)*
- *insect dichotomous key*
- *4 petri dishes*
- *4 fossil samples*
- *forceps*
- *magnifying glass*

Appendix C: Lab Materials by Activity (Semester B)

Italicized materials listed below are available in the *Edmentum Biology Kit with Microscope*.

Unit	Activity Name	Task	Equipment List
1	Course Activity: Classifying Organisms * <i>Special lab materials required. (Edmentum Biology Kit with Microscope or school lab materials)</i>	Task: Classifying Organisms	Italicized items are found in the <i>Edmentum Biology Kit's</i> bags labeled "Classifying Organisms" and "Common Materials" and the box labeled "Microscope." <ul style="list-style-type: none"> • <i>microscope</i> • <i>insect specimens in solution</i> • <i>insect dichotomous key</i> • <i>4 petri dishes</i> • <i>forceps</i> • <i>magnifying glass</i> • <i>disposable safety gloves</i> • <i>safety goggles</i>
1	Unit Activity: Organization of Organisms * <i>Special lab materials required. (Edmentum Biology Kit with Microscope or school lab materials)</i>	Task: Organization of Organisms	Italicized items are found in the <i>Edmentum Biology Kit's</i> bags labeled "Organization of Organisms" and "Common Materials." <ul style="list-style-type: none"> • <i>4 fossil samples</i> • <i>magnifying glass</i>
2	Course Activity: Adaptations in a Changing Environment	Task: Simulating Adaptations in a Species	none
2	Course Activity: Artificial Selection and the English Bulldog	Task: Planning and Writing a Research Paper	none
2	Unit Activity: Evolution	Task: Developing a Molecular Clock Model	none

Unit	Activity Name	Task	Equipment List
3	Course Activity: Aerobic and Anaerobic Respiration	Task: Testing Yeast Respiration	<ul style="list-style-type: none"> • 5 24-ounce clear drinking glasses (either glass or plastic, as long as they can safely hold hot water) • 1 cup boiling water (212° Fahrenheit) • 1 cup cold water (with 1 to 2 ice cubes) • 3 cups lukewarm water (100° Fahrenheit) • 5 (0.25-ounce) packets dry yeast • 4 tablespoons sugar • ruler with a metric scale • plastic wrap (enough to cover the top of one glass) • food thermometer (must go up to 100° Fahrenheit) • spoon • oven mitts
3	Unit Activity: Energy Use and Organisms	Task: Track and Analyze Your Food Intake	<ul style="list-style-type: none"> • measuring cups (optional) • tablespoon (optional) • kitchen scale (with 0.1 gram accuracy; optional)
4	Course Activity: Competition in Aquatic Ecosystems	Task: Modeling a Food Web	<ul style="list-style-type: none"> • paper • a pen or a pencil • word-processing or graphic-design software
4	Course Activity: Solving a Biodiversity Problem	Task: Creating a Deforestation Simulation	none
		Task: Creating a Presentation	<ul style="list-style-type: none"> • presentation software
4	Unit Activity: The Interdependence of Ecosystems	Task: Designing an Eco-Friendly Home	<ul style="list-style-type: none"> • ruler with a metric scale • pencil • poster board or graph paper